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PAPERS
IN
POLITE ARTS.

The SILVER MEDAL was this Session voted to Mr. PETER NICHOLSON, of Oxford Street, for a new Centro-Linead for drawing Lines to a vanishing Point. The following Communications were received from him, an explanatory Engraving is annexed, and a complete Instrument is preserved in the Society's Repository.

SIR,

I BEG leave to send to you for the approbation of the Society of Arts, &c. a new combination of my invention for drawing lines to a point at any given distance out of the paper or drawing board. An instrument extremely useful in perspective, for drawing lines to a vanishing point, however remote, for dialling, for drawing the hour lines where the intersection of the style would run out of the

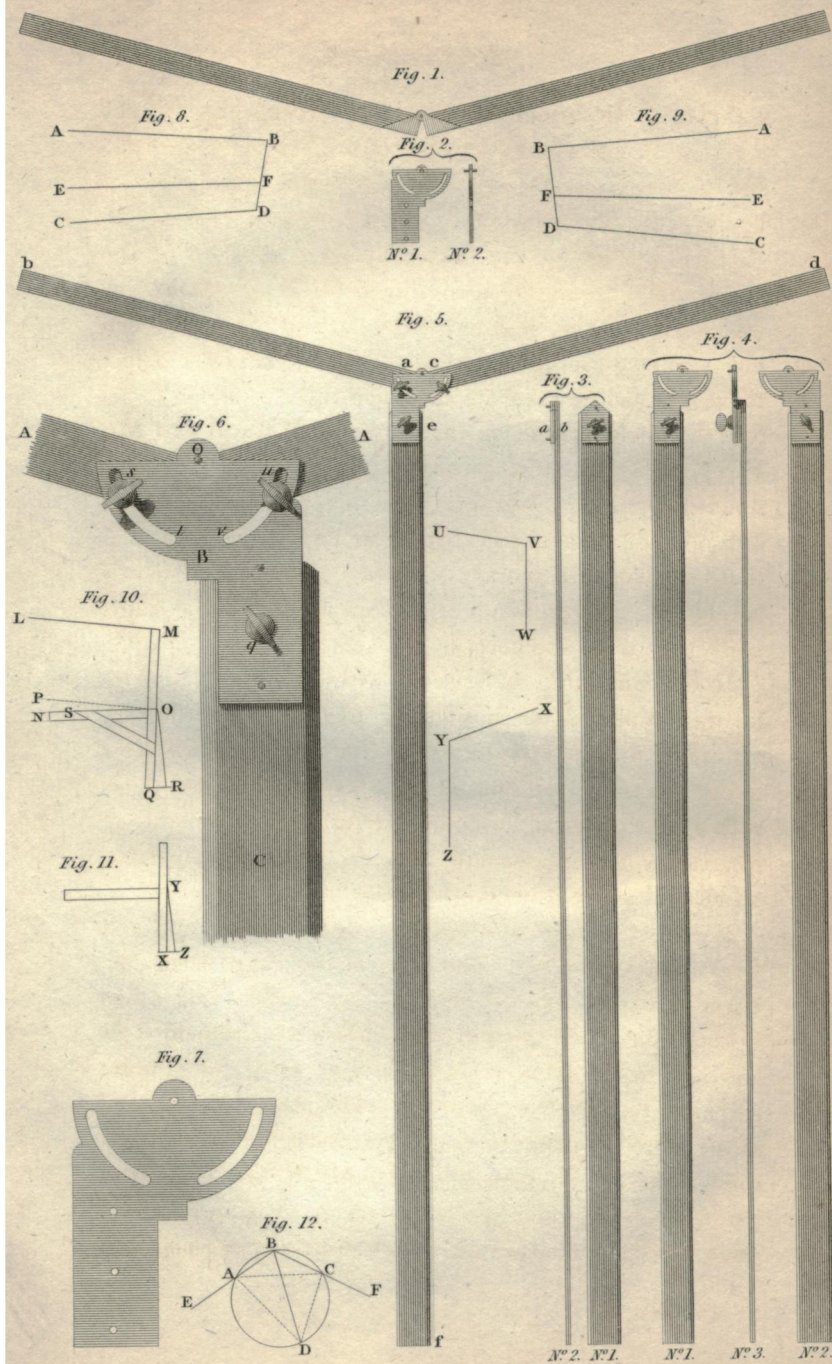
dial plane. In bridge building for drawing the radii of the arch stones where they are of different thicknesses; and in other numerous instances in Architecture that would be too tedious to mention.

It will perhaps be recollected by some members of the Society that I produced a combined Cyclograph and Centro-linead, on the bisecting principle, at the time when my improved method of squaring hand-rails was before them. I had however no intention then of laying it before the Society, and it was only when I heard that Mr. Farey, Jun. had it in contemplation to bring forward a somewhat similar invention of his in opposition to my addition to the parallel rules, so as to form a centro-linead, that I added a temporary wooden drawing-blade to my combined cyclograph and centro-linead, to make it more perfectly answer the purpose of a centro-linead.

Upon comparing it however with Mr. Farey's instrument, it appeared much superior to it, as, in setting his for use he had recourse to several trials, first to draw a line to cut the two given lines at equal angles, and then to set each of the angular limbs of the instrument separately; whereas in my instrument, by a very simple geometrical problem, I set it at once.

My intentions of showing my altered Cyclograph and Centro-linead to the Committee at the time when Mr. Farey's instrument was before it, was to show that I had neither taken the principle of Mr. Farey's instrument from him, nor worked upon his invention, as I can produce witnesses to prove the contrary. The idea of it occurred to me more than twenty years ago, and five years since I shewed the principle of it both to Mr. Robert Gibson of Hampstead, an ingenious watchmaker, and an excellent geometrician, and also to Mr. Coraelius Varley; and it is

M^r Peter Nicholson's Centrolinead.



more than two years since I also shewed it to Mr. Gill, one of the chairmen of your Committee of Mechanics. In the course of that evening, when Mr. Farey's instrument was before the Committee, several of the members expressed their approbation of mine, and wished me to bring it before the Society.

I accordingly turned my thoughts towards its improvement, and the result has been that I discovered that it was not necessary for the drawing blade of the instrument to bisect the other two limbs that slide along the pins, and therefore that it might be constructed in a much simpler manner, and be applied to practice with far greater ease than on the bisecting principle, as the pins may be fixed in any manner whatever, but out of the space contained between the two given lines, and no geometrical operation is necessary in setting it for use. The instrument I shewed to the Committee cost me four guineas; this however can be made for less than eight shillings, and is more convenient for drawing lines on paper than that of mine rewarded by the Society on the principle of the parallel ruler, which however is superior to this for the use of engravers. Should the Society approve of this new instrument, I will furnish a complete description of it, and a geometrical demonstration of the principle upon which it is constructed.

I am, Sir,

Your obedient Servant,

PETER NICHOLSON.

No. 10, Oxford Street,
London, Feb. 9, 1815.

To C. TAYLOR, M. D. SEC.

Description

Description and Properties of the Instrument.

IN making large perspective drawings of objects to be viewed at long distances, very great inconveniences generally occur to the delineator, on account of the vanishing or other parts running out to distances which require the use of a very long ruler inconvenient to handle, and the whole length of the apartment for his own use, and very frequently the vanishing points are so remote as to exceed the length of any moderate room. In order to obviate the last of these inconveniences, the draughtsman is either under the necessity to shorten the distance of the point of view, and thus giving a very distorted representation of the object, or first to make a drawing on a small scale, and then to enlarge it.

Other means have also been resorted to :—one practical method is by proportional scales at each end of the drawing-board ; thus, if the object to be represented be a building, having all the parts on the plan at right angles to each other, two scales at each end of the drawing-board become necessary, but this method requires very great attention, and is liable to great inaccuracy, particularly in drawing lines at very near distances from each other. Another method which the delineator has recourse to, in order to draw lines to a remote point out of the drawing-board or tables, having two given lines inclining to each other, and a point through which it is required to draw a third line tending to the same point with the two given lines, is by drawing two parallel lines so as to be intercepted by the two given lines, one of the parallel lines being made to pass through the given point, and through the point of division, will tend to the same point.

Another method is by finding the representation of two
points

points of any original line, and drawing a line through these two points.

These methods, as well as others which might be mentioned, are attended with intolerable labour, and liable to very great inaccuracy, and the constructive lines embarrass the work, and render the operation intricate and confused.

To draw lines with facility to tend to a remote point at any given distance, has therefore been justly considered as a desideratum in perspective. To accomplish this object, Mr. Peter Nicholson, No. 10, Oxford Street, has invented two instruments, called *Centro-lineads*, for which he has been honoured with the approbation of the SOCIETY OF ARTS. One of these Instruments, well adapted for the purposes of engraving, was rewarded last year (1814), and the Society have this year voted to him for his invention and ready mode of adjusting of the other, the Silver Medal. This last centro-linead is well adapted to perspective delineation, and performs its office with as much facility as parallel and perpendicular lines, may be drawn by a common square on the edge of a drawing-board, and even with greater accuracy, the latter depending on the edge of the board, and the stock of the square being straight. This instrument is not entirely confined to the use of drawing lines to a point, but will also draw parallels with the same facility.

Description of the Centro-linead for Delineation.

THIS instrument consists of a joint rule, each leg of which is in length similar to a carpenter's rule. The knuckle is pierced with a small hole through the centre of

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the rivet, to admit of a blade being fitted to it, in order to draw the line as required. Each edge of the blade is made quite straight, and may either be parallel to each other, or be made to taper, so as to render it light. In constructing the instrument the broad end of the blade (should there be any difference) must be placed next to the joint of the legs to those which fold or shut together, and one of the edges must tend to the axis of the cylindric rivet. This edge is called the drawing or fiducial edge; and thus the blade is fixed upon the side of the legs next to the external angle, and the whole is clamped or fastened together by means of a semicircular plate of brass, which has a circular slit or grove next to each edge. One edge of the brass plate is straight, and forms a diameter to the semicircle; from this diameter another small semicircle projects equal to or less in diameter than that of the knuckle, so that each of these semicircles may have the same common centre, viz. the axis of the rivet. The brass plate is extended beyond the circumference of the greater semicircle, in order to attach the blade, and is pierced with a small hole in the direction of the axis of the rivet, and a steady pin is inserted and made to project outwards from each face of the brass plate, so as to fit the hole exactly. In order to keep the two legs together, so that either side of the brass plate may adjoin the faces of the legs, which are always in the same plane, whatever angle they make with each other.

Each edge of the legs which shut together is in the same plane with the axis of the rivet, and these two edges are called the sliding edges. Each of the slits next to the larger semicircular part of the plate, is the arc of a circle, concentric with both semicircles. The brass plate is fastened to the legs by a screw inserted through each slit,
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and tapped into each leg. The extended part of the brass plate on the convex circumference of the greater semicircle, is also pierced, and a screw inserted through the hole, and tapped into another rectangular plate; and to keep the drawing or central edge of the blade so as not to be moved: when the instrument is clamped by the screws, two metal steady pins are made fast to the lower plate, and the upper plate with the two semicircles and projecting part is pierced to receive them. The two steady pins are placed in a straight line, passing longitudinally along the faces of the blade, and dividing it into two equal and similar parts. Two of the sides of the legs must be in the same plane with one of the sides of the blade. The blade is made to fix upon either side of the plate, and either side of the plate, as before mentioned, to the same side of the legs, so that the drawing edge may be reversed, as the vanishing point may be on the right or left hand. The drawing edge of the blade must be made to form any given angle with the sliding edges of the legs; and either of the angles must be made moveable, while the other is stationary, and may be made to fix at pleasure.

The Centro-linead may be provided with blades of several lengths, in order to accommodate drawings of various sizes. The two edges of each of the legs should be parallel, so that either of the opposite edges of the same leg and the drawing edge may form the same angle, for the convenience of setting the instrument to any given angles required.

To use the Centro-linead.

Let two converging lines be given: draw a straight line so as to be intercepted by the converging lines: let the two angles which are made by the drawing edge and the

two sliding edges be called the *angles of the instrument*, as the angle formed by the two sliding edges is regulated by them, and let the edges of the legs opposite the sliding edges be called the *outer edges*. Unscrew one of the angles of the instrument, and set that angle to one of the angles formed by the transverse line, and one of the converging lines, then clamp the angle thus set : unscrew the other angle, and set the angle now unscrewed, to the remaining angle formed by the transverse line, and the other given line, and clamp the angle of the instrument now set. Put a pin in each of the angles formed by the two converging and intercepted lines : place each of the sliding edges upon each respective pin, and suppose any given intermediate point, between the two converging lines ; slide each edge upon each pin, until the drawing edge fall upon the given point ; then keep the instrument stationary ; draw a line along the drawing edge, and the line thus drawn, will tend to the same point with the two given lines.



Reference to the Engraving of Mr. NICHOLSON's Centrolinead. Plate 4. Fig. 1 to 10.

Fig. 1, a representation of the legs or joint rule, with a cylindric hole in the axis of the rivet, and with a hole in each leg to receive the screws.

Fig. 2, a representation of the brass plate : No. 1, shows the face with the two circular grooves, and a pin in the centre, and with three holes in the projecting part : No. 2, is an orthographical representation of the brass plate on edge with the centre-pin, projecting alike on both sides :
each

each end of the pin being made to fit the hole through which the axis of the rivet passes.

Fig. 3, a representation of the blade which is chamfered on each edge with a projecting rectangular plate on the top, soldered to the blade, and thereby forming one solid: No. 1, shews the top of the blade with the projecting part, which has a steady pin near each end of it, and a hole tapped to receive the screw in the middle: No. 2, a representation of the edge of the blade, shewing the projecting part and the two steady pins.

Fig. 4 represents the semicircular plate fig. 2, fastened to the blade fig. 3, by means of the screw and steady pins of fig. 3, being made to fit the holes of the plate in fig. 2, exactly: No. 1, is a representation of the top: No. 2, another representation of the top, in which the other side of the plate, fig. 2, is laid downwards, so that the edge which is directed to the centre of the pin in No. 2, is upon the contrary side of the blade to that which it was in No. 1: No. 3, a representation of the edge.

Fig. 5, a representation of the Centro-linead, with all the parts screwed together, in order to be applied for the drawing of converging lines: $a b, c d$, are the folding or sliding edges; $e f$ is the fiducial, or drawing edge of the blade; \odot is the projecting pin of a cylindric form, the axis of which coincides with the axis of the rivet, and is perpendicular to the plane of the instrument, and fixed in a straight line with the edge $f e$ of the blade, and the edges $b a$ and $d c$ of the legs.

Fig. 6, part of the Centro-linead, screwed together, to half the real size: s and u are finger screws, inserted in the slits $s t$ and $u v$, and tapped into the legs A, A . The under side of the blade C , and the under side of the legs A, A , are in one plane, in order to coincide with the surface
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of the paper or drawing. From this consideration, it becomes necessary to make the thickness ab , fig. 3, No. 2, of the blade and rectangular plate together, equal to the thickness of the joint rule, fig. 1; since the under side of the plate is in the same plane with the upper side of the legs, which are parallel to the plane of the paper: $b\odot f$ and $d\odot f$, fig. 5, are here termed the angles of the instrument, and the point \odot is called the centre of the instrument.

Fig. 7, a representation of the brass plate to half the real size.

Application. Plate 4.

To set the instrument to any two given angles. Let UVW and XYZ be the two given angles; place the centre \odot upon the point V , and the edge $\odot b$ upon the straight line VU , then slackening the screw to permit the edge ef of the blade to revolve on the centre \odot ; revolve $\odot f$ until it fall upon VW , while the edge $\odot b$ remains upon the line VU , then tighten the screws, and the angle $b\odot f$ will be equal to the angle UVW .

In the same manner the angle $d\odot f$ may be set to the angle XYZ , by placing the centre \odot upon Y , and $\odot d$ upon YX , and slackening the screw u , and revolving the edge $f\odot$ until it coincide with YZ ; then tightening the screw u , the instrument will be set.

Any two converging lines, AB , and CD , Fig. 8, and a point E between them, being given in position, it is required to draw a straight line through the point E , that shall tend to the same point with AB and CD .

Draw

Draw any straight line BD , intercepted by AB and CD , and by problem 1, set one of the angles $b o f$ of the Centro-linead to the angle $B D C$, and the other $d o f$ to the angle $D B A$: put a pin or needle in the point B , and another in D : then, laying the Centro-linead with its proper side upon the paper, place the sliding edge $a b$, upon the pin B , and the sliding edge $d e$, upon the pin D ; then slide the legs upon the pins B and D , until the edge $e f$, of the blade fall upon the point E ; then keeping the instrument stationary, draw the line EF , and all the three lines AB , CD , EF , would, if produced, meet in the same point, as will be demonstrated.

N.B. If the converging lines AB , and CD , fig. 9, should tend to a point on the other hand, the instrument must be thus reversed;—take out the finger-screw q of fig. 6, and take off the blade, fix it on the side of the brass plate now uppermost, then take out the screws u and s , turn the plate B , so that the side which was before the top, will now be underneath, and coincident with the upper sides of the legs, and the pin \odot , will again be inserted in the hole in the axis of the rivet; then insert the screws through the slits of the brass plate into the legs; then the instrument may be set and used as before.



A very useful Method of setting the Instrument by trial.

If we were required to draw lines to tend to the same point, the pins may be fixed in any two points out of the two given lines, and out of the space which they include: thus, place the Centro-linead upon the pins, and slide it along them, until the drawing edge either fall upon, or

cross one of the given lines, then loosen the screw next to the furthestmost pin, and move the angle more or less, pressing the legs gently upon the pins, until the drawing edge coincide with the line; then, fastening the screws, slide the legs upon the pins until the drawing edge coincide with the other given line or cross it; then, if the drawing edge coincide, the instrument is set; but if not, the screw next to the pin now the most remote, must be loosened, and the Centro-linead must be set as before. The instrument must then be returned to the first line, and if it agrees with it, it is set; but if not, the screw which is between the drawing edge and the remote pin must again be slackened, and the angle moved as before, until the blade coincide with the line; then make the screw fast, and the instrument will be set.

In some cases it will require to be returned to the other pin, but in general four movements will be sufficient. This method of setting the Centro-linead by trial is very useful in general cases, as, suppose in perspective the vanishing line of the horizon, and another line tending to a vanishing point in the vanishing line of the horizon to be given; it will be very convenient to set the Centro-linead so as to draw lines without the two given lines, as there is generally a part of the perspective drawing below the vanishing line of the horizon, more or less depending on the height of the eye above the level of the plane on which the object is situated.

Though a perspective drawing may be finished with one Centro-linead, whatever be the number of vanishing points; yet to prevent the frequent setting of the instrument, it will be much more convenient to employ two.

To make a temporary Centro-linead: let LM and NO, fig. 10, be two given lines; draw any straight line M O Q, upon

upon which place the straight edge of a ruler; fix the straight edge of another ruler upon NO , fasten these two straight edges by means of a brace, then fasten the piece QOR to the straight edge MOQ , so that the angle QOR may be equal to the angle PON , which is formed by drawing OP parallel to LM , and the whole thus constructed will be an immovable Centro-linead.

A common square, fig. 11, may be converted into a Centro-linead, by the addition of a triangular piece XYZ , and thus may be very useful when a drawing is long in hand.

Since writing the above explanation, the instrument has been improved, and made to slide to the centre of the rivet;—by this means it may be set at once upon the pins, which is a very great convenience; and the joint is so contrived as to admit of legs of different lengths, as well as blades of different lengths.

To demonstrate the Properties of the Instrument.

LET $ABCD$ be a circle, and let A and C be two fixed points, and let B be any intermediate point in the segment ABC ; join BA and BC , producing BA to E , and BC to F . Then because the points A and C , and the angle ABC are given, the point B is in the circumference of a given circle, and because the point A , and the angle ABD , and the circle $ABCD$ are given, the point D is also given: therefore if while the rules BE and BF , slide upon the pins A and C , the middle rule BD will always be upon the point D , or tend to the point D , should BD not be so long as to reach D .

The

The THANKS of the Society were this Session voted to Mr. CORNELIUS VARLEY, 42, Newman-Street, for his Improvement of a portable Easel for Painters. The following Communication was received from him, an explanatory Engraving is annexed, and an Easel on this Construction preserved in the Society's Repository.

DEAR SIR,

I BEG leave to present to the Society of Arts, &c. a Portable Easel on Mr. Williams's construction, but so simplified that any carpenter can make it as cheap as his ordinary work. The wood-work cost seven shillings, the strap-hinge, five screws and steel, about one shilling; so that the whole price is eight shillings. I mentioned that Mr. Cobley, joiner and frame-maker, Evelyn's-buildings, Oxford-street, makes them for that price.

I am, Sir,

Your very humble servant,

CORNELIUS VARLEY.

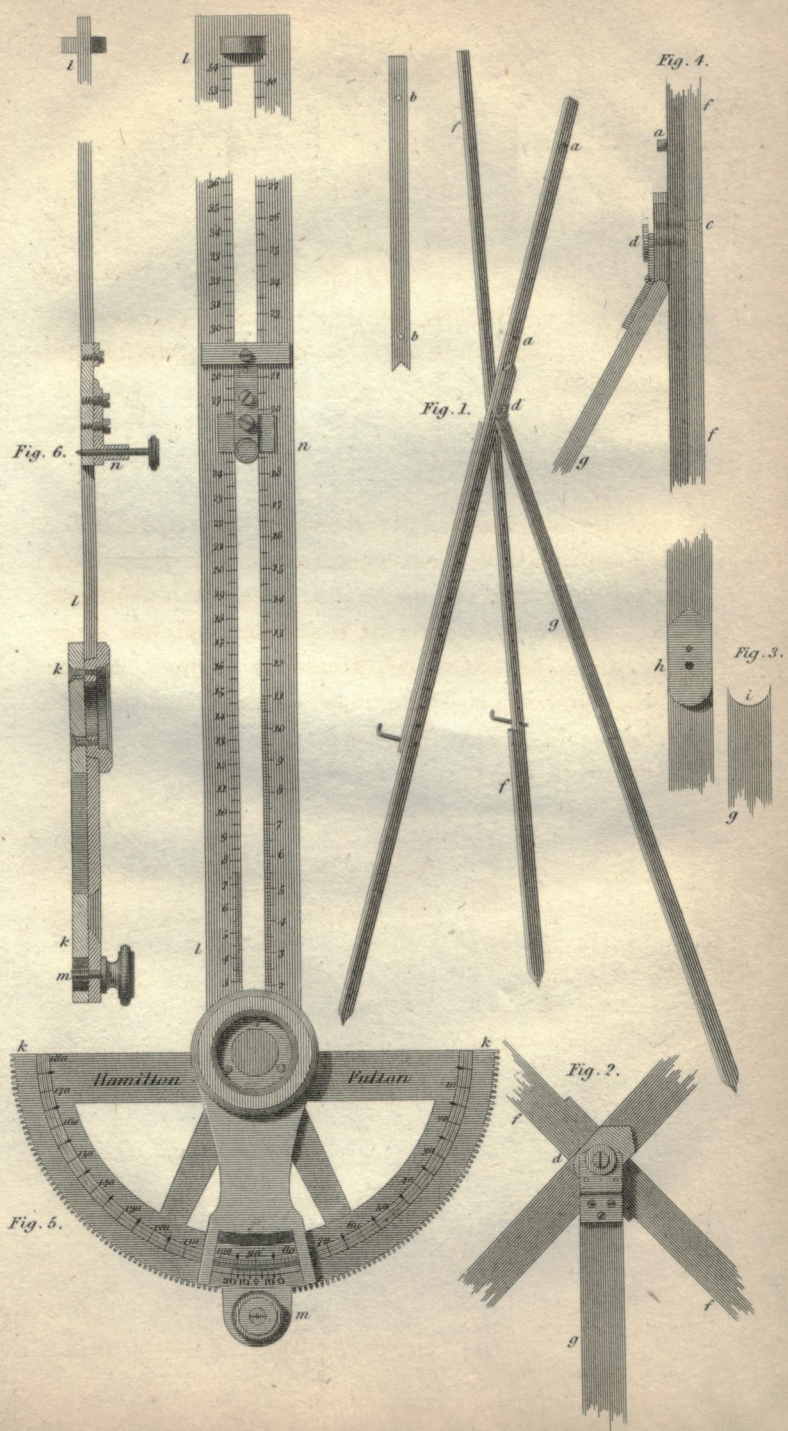
Reference to the Engraving of Mr. CORNELIUS VARLEY's Portable Easel, Pl. 5, Figs. 1, 2, 3, 4.

Fig. 1, shews a back view of the Easel, the mode of opening it, and the place of the joints.

The

M^r. Fulton's Protractor.

M^r. C. Varley's Easel.



The improvement consists in making two joints with common wood screws, one for the front cross bar *ff*, to turn on the other for the prop *g*, and so near together as to be quite as good, and a great deal cheaper, than those heretofore sold.

Fig. 2, shews the joint of the prop *g*, made with a long brass strap-hinge, fastened to the Easel by one screw *d*, through a brass collar, under which the hinge can move, but so tight as not to slip of itself.

Fig. 3, shews the block *h*, glued to the Easel, rounded at bottom to fit the hollow *i* of the prop, over which the hinge is fastened.

Fig. 4, is a side view or section, to shew how the two screws which form the joints, are placed one above the other. The front screw *c* has a square collar under its head let in flush to the Easel; *d* is a round collar under the back screw head, to keep the hinge close; both these screws have a double thickness of the wood for their threads to hold in, so the joints are quite strong and sound.

This Easel is made out of $\frac{3}{4}$ -inch stuff, and nearly two inches wide, so that when shut up, it makes a square pole nearly two inches thick, and six feet six inches long, but, if made longer, I should recommend the joints to be kept about the same distance from the bottom, viz. four feet six inches; *aa* are two wood studs on which the piece *bb* used as a rest are placed when the apparatus is closed and not in use.

CORNELIUS VARLEY.

The

The SILVER MEDAL was this Session voted to Mr. HAMILTON FULTON, of Newman Street, Oxford Street, for an improved Instrument which unites the properties of the Protractor, Scale and Compasses. The following Communication was received from him, an explanatory Engraving is annexed, and the Instrument is preserved in the Society's Repository.

SIR,

THE instrument which I have now the honor of submitting to the Society of Arts, &c. unites the protractor, scale, and compasses, and by one operation, determines the quantity of the angle, and the depth of the line.

For example, it is required from a given line to lay down an angle of sixty degrees, and a distance of twenty-five feet, yards, chains, or miles. The first thing to be done is to place the inner edge of the slider at twenty-five on either of the scales; (this may be done before or after the instrument is laid on the paper), then place the diameter of the semicircle to the base line, and the cross at the centre upon the point of the angle; next move the nonius to the required quantity of the angle 60° ; press the prick on the paper, and the point is the edge and distance required.

This instrument I have used very advantageously in my business, about six years; it may be applied to any purpose requiring the use of the three instruments
above.

abovementioned, but will be more particularly useful in laying down land surveys, ships' courses, &c.

I am, Sir,

Your obedient humble servant,

HAMILTON FULTON,

Land-Surveyor.

9, Newman Street, January 13th, 1815.

To C. TAYLOR, M.D. SEC.

A further Example of the Application of Mr. FULTON'S Instrument.

SUPPOSE it was required to construct a right-angled triangle, of which the hypotheneuse is 50 feet, and the angle at the base 35 degrees ;

Subtract 35° from 90° , and there remains 55° , which is the other angle of the triangle. Draw a straight line, place the inner edge of the slider at 25° ; set the nonius to the angle of 35° ; then place the cross at the centre upon a given point in the straight line, and bring the pricker to the said line, and press it down, which will mark off the distance required; then by the edge of the semicircle, which makes the acute angle, draw a straight line of any indefinite length for the base; remove the instrument and set it to the remaining angle 55° ; place the cross in the centre upon the point made by the pricker, and bring the pricker again to the line, which will fall upon the point where the centre of the instrument was placed; the instrument being now turned the one end for the other, draw another straight line by the diameter of the semicircle forming the acute angle,

angle, which must now be upon the same side of the line as before; then continue the two straight lines till they meet, and the triangle will be constructed as required.

*Reference to the Engraving of Mr. FULTON's Instrument,
or Protractor, Pl. 5, Figs. 5, 6.*

Fig. 5—The letters *kk* shew the protractor drawn half the real size.

ll—The scale.

m—The pinion to move it.

n—The pricker or compass point.

Fig. 6—Shews a section of the instrument.
